



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/879,664	06/12/2001	Stanislav V. Aleshin	L13.12-0149/01-026	2932

7590 07/23/2004
Leo J. Peters
LSILOGIC CORPORATION
M/S D-106
1551 McCarthy Boulevard
Milpitas, CA 95035

EXAMINER

CHAWAN, SHEELA C

ART UNIT PAPER NUMBER

2625

DATE MAILED: 07/23/2004

5

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/879,664

Applicant(s)

ALESIN ET AL.

Examiner

Sheela C Chawan

Art Unit

2625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 June 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9-14 and 21-24 is/are allowed.
- 6) ☒ Claim(s) 1,7,8,15,19,25 and 26 is/are rejected.
- 7) ☒ Claim(s) 2-6,16-18,20,27 and 28 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The Examiner has approved drawings filed on 10/15/01.

Claim Objections

2. Claims 2 - 8, 11 - 14, 16 - 18, 20, 23, 24, 26, 27 and 28 are objected to because of the following informalities:

Claim 2 is objected to because of the following informalities:

In claim 2, line 3, change “, “ to --; --.

Similarly all the claims need to be corrected.

Appropriate correction is required.

Reason For Allowance

3. The following is an examiner's statement of reasons for allowance:

The present invention is directed to a process of designing a mask for use in a photolithographic process to form a predetermined feature on a substrate, the process comprising steps of, claim 9 recites a method comprising comparing the function of the selected local image to the function set of a class of local images; and assigning the selected local image to a class based on the results of step (e). The closest prior art, Filseth et al. (US.6,611,953 B1) discloses a mask correction optimization. Each of the above references either singularly or in combination, fail to anticipate or render the above limitation obvious.

Claims 9-14 are allowed.

Regarding claim 21, claim 21 recites similar limitation as claim 9 above and

similarly analyzed except for the step of a computer readable program in the computer useable medium.

Claims 21- 24 are allowed.

Allowable Subject Matter

4. Claims 2, 3 - 6, 16 -18, 20, 27 and 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 U.S.C. § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 7, 8 and 15, 19, 25 and 26 are rejected under 35 U.S.C.102(e) as being anticipated by Filseth et al. (US.6,611,953 B1).

The applied reference has a common assignee with the instant application.
Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art

under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

As to claim 1, Filseth discloses a process of designing a mask for use in a photolithographic process to form a predetermined feature on a substrate using a process light intensity, the process comprising steps of abstract, column 1, lines 35- 45):

a) defining a mask for use in the photolithographic process, wherein the mask (column 1, lines 10- 22) has at least one boundary matching a boundary of the feature (column 1, lines 49- 51, fig 4, column 3, line 65 through column 4, line 8);

b) identifying a location of the process light intensity relative to the mask boundary (column 3, line 65 through column 4, line 8);

c) segmenting the mask boundary into a plurality of regions, each region having a midpoint (column 4, lines 49- 51);

d) Calculating a distance normal to the boundary in each region between the respective region midpoint and the location of the process light intensity (column 4, line 49 through column 5, line 3);

e) identifying if a close connection relative to the respective region (column 2, lines 30-42); and

f) for each region, moving the region a distance based on the distance calculated in step (d) and the identification in step (e) (column 4, line 49 through column 5, line 8).

As to claim 7, Filseth discloses the process further including steps of:

1) defining a plurality of first pattern points along a first axis normal to a boundary of the mask defining the feature (column 1, lines 50- 57, column 4, lines 1- 37, 49- 67, column 5, lines 1- 8),

m) calculating a diffusion shift of a photoresist based on a process light intensity at each pattern point (column 2, lines 1- 7, 30- 46), and

n) shifting the boundary of the mask a distance along the first axis based on the diffusion shift (column 2, lines 1- 7, 30- 46).

As to claim 8, Filseth discloses the process further including the step:

o) defining a plurality of second pattern points along a second axis parallel to the boundary (column 6, lines 38- 64), and wherein step (m) includes steps of (column 4, lines 1- 37, 49- 67, column 5, lines 1- 8),

ml) calculating first and second subsidiary values based on the light intensities at each pattern point (column 2, lines 1- 7, 30- 46), and

m2) calculating the diffusion shift based on the first and second subsidiary values (column 4, lines 1- 37, 49- 67, column 5, lines 1- 8, column 8, lines 1- 26).

As to claim 15, Filseth discloses a process of designing a mask for use in a

Art Unit: 2625

photolithographic process to form a predetermined pattern in a photoresist on a substrate using a process light intensity, the pattern representing a feature being formed on the substrate, the process comprising steps of (abstract):

a) defining a plurality of first pattern points along a first axis normal to a boundary of the mask defining the feature (column 3, line 65 through column 4, line 8, column 4, lines 9-16, 49- 67);

b) calculating a diffusion shift of a photoresist based on a process light intensity at each pattern point (column 2, lines 1-7, 30- 46, column 8, lines 1-26); and

c) shifting the boundary of the mask a distance along the first axis based on the diffusion shift (column 2, lines 1 - 7, 30 - 46).

As to claim 19, Filseth discloses a computer useable medium having a computer readable program embodied therein for addressing data to cause a computer to design a mask for use in a photolithographic process to form a predetermined feature on a substrate using a process light intensity, the computer readable program in the computer useable medium comprising (column 2, lines 43- 46, column 8, lines 1- 26):

first computer readable program code for causing the computer to define a mask for use in the photolithographic process, wherein the definition of the mask includes a definition of at least one boundary matching a boundary of the feature (column 1, lines 10-22,49-51, fig 4, column 2, lines 43- 46, column 3, line 65 through column 4, line 8, column 8, lines 1- 26, a first computer readable program code further defining least one region having a length along each edge of the mask feature);

second computer readable program code for causing the computer to identify a definition of a location of the process light intensity relative to the definition of the mask boundary (column 2, lines 43- 46, column 3, line 65 through column 4, line 51, column 8, lines 1- 26, a second computer readable program code further defining a table of light values and distance from a center of a light);

third computer readable program code for causing the computer to segment the definition of the mask boundary into a plurality of regions, with each region having a defined midpoint (a third computer readable program code for causing the computer to identify a length of each line between a midpoint of each region and each of a plurality of points along edges of the mask feature, column 2, lines 43- 46, column 4, line 49 through column 5, line 3, column 8, lines 1- 26);

fourth computer readable program code for causing the computer to calculate a distance A normal to the definition of the boundary in each region between the definitions of the respective region midpoint and the location of the process light intensity (a fourth computer readable program code for causing the computer to adjust the amount of movement of each region whose area of movement is affected by movement of an adjacent region column 2, lines 43- 46, column 4, line 49 through column 5, line 3, column 8, lines 1- 26);

fifth computer readable program code for causing the computer to identify if the definition of the mask includes a close connection exists relative to the respective region (fifth computer readable program code for causing the computer to derive a

Art Unit: 2625

matrix of contributions of movement factors, column 2, lines 43- 46, column 8, lines 1- 26); and

sixth computer readable program code for causing the computer to move the definition of the respective region a distance (δ) based on the distance d and the identification of any close connection (sixth computer readable program code for causing the computer to define movement for each region by an amount derived from the matrix, column 2, lines 43- 46, column 4, line 49 through column 5, line 8, column 8, lines 1- 26).

As to claim 25, Filseth discloses a computer useable medium having a computer readable program embodied therein for addressing data to cause a computer to design a mask for use in a photolithographic process to form a predetermined pattern in a photoresist on a substrate using a process light intensity, the pattern representing a feature being formed on the substrate, the computer readable program in the computer useable medium comprising:

first computer readable program code for causing the computer to define a plurality of first pattern points along a first axis normal to a definition of a boundary of the mask defining the feature (column 1, lines 10-22, 49-51, fig 4, column 2, lines 43- 46, column 3, line 65 through column 4, line 8, column 8, lines 1- 26, a first computer readable program code further defining least one region having a length along each edge of the mask feature);

second computer readable program code for causing the computer to calculate a diffusion shift of the photoresist based on the light intensities at each pattern point

Art Unit: 2625

(column 2, lines 43- 46, column 4, lines 49- 51, column 8, lines 1- 26, a second computer readable program code further defining a table of light values and distance from a center of a light); and

third computer readable program code for causing the computer to shift the definition of the boundary a distance along the first axis based on the diffusion shift (a third computer readable program code for causing the computer to identify a length of each line between a midpoint of each region and each of a plurality of points along edges of the mask feature, column 2, lines 43- 46, column 4, line 49 through column 5, line 3, column 8, lines 1- 26).

As to claim 26 Filseth discloses the computer useable medium further including:

fourth computer readable program code for causing the computer to define a plurality of second pattern points along a second axis parallel to the boundary definition, and wherein the second computer readable program code includes (a fourth computer readable program code for causing the computer to adjust the amount of movement of each region whose area of movement is affected by movement of an adjacent region, column 2, lines 43- 46, column 6, lines 38-64, column 8, lines 1- 26);

fifth computer readable program code for causing the computer to calculate first and second subsidiary values based on the light intensities at each pattern point (fifth computer readable program code for causing the computer to derive a matrix of contributions of movement factors, column 2, lines 1-7, 30- 46, column 8, lines 1- 26); and

sixth computer readable program code for causing the computer to calculate the diffusion shift based on the first and second subsidiary values (sixth computer readable program code for causing the computer to define movement for each region by an amount derived from the matrix, column 2, lines 43- 46, column 4, lines 1-37, 49- 67 column 5, lines 1-8, column 8, lines 1- 26).

Other prior art cited

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Pierrat et al. (US. 6,539,521 B1) discloses dissection of corners in a fabrication layout for correcting proximity effects.

Tsudaka (US. 6,249,597 B1) discloses method of correcting mask pattern and mask, method of exposure, apparatus thereof, and photomask and semiconductor device using the same.

Garza et al. (US. 5,723,233) discloses optical proximity correction method and apparatus.

Rieger et al. (US. 6,081,658) discloses proximity correction system for wafer lithography.


Contact Information

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sheela C Chawan whose telephone number is 703-305- 4876. The examiner can normally be reached on Monday - Thursday 6 - 7.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on 703-308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SCC
Sheela Chawan
Patent Examiner
Group Art Unit 2625
July 16, 2004


BHAVESH M. MEHTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600